

Acoustics

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#1: Course Outlines

Aim

To provide students with the theoretical and measurement fundamentals of the science of sound and vibration.

At the end of the course, the students should both analytically and experimentally be able to apply this knowledge to the **construction of quiet and vibration-free constructions** such as vessels, machines, and processes as well as be capable to **determining and minimizing the sound and vibration fields** that arise in various environments.

Lectures

Week	Subject	Lecturer
1	Course Outlines	Dr. Adel Elsabbagh
2	Basic Concepts	Dr. Adel Elsabbagh
3	Acoustical Quantities and Wave Phenomena	Dr. Adel Elsabbagh
4	Signal Analysis	Dr. Adel Elsabbagh
5	Analysis of Simple Mechanical Systems	Dr. Adel Elsabbagh
6	Wave Equation and Measurement Techniques	Dr. Adel Elsabbagh
7	Systems in 2D	Dr. Wael Akl
8	Midterm exam	
9	Building Acoustics	Dr. Tamer Elnady
10	Sound in Ducts	Dr. Tamer Elnady
11	Noise and Vibration Control	Dr. Tamer Elnady
12	Sound and Vibration of Selected Machines	Dr. Tamer Elnady
13	Standards and Regulations	Dr. Tamer Elnady
14	<i>Holiday (Study for the exams)</i>	

Sections

Week	In the Section	Required from the student
1		
2		
3	Sheet 1	
4	Sheet 2	
5	Matlab Computer Lab.	Sheet 1
6	Sheet 3	Sheet 2 + Lab report
7	Vibration Measurement Lab.	
8	Revision	Sheet 3 + Vibration Measurement Lab report
9	Midterm exam	
10	Sheet 4	
11	Sheet 5	
12	Sheet 6	Sheets 4, 5
13	Acoustics Measurement Lab.	Sheet 6
14		

Laboratory Work

1. **Matlab Computer Lab: Introduction to Matlab.**
Solution of a mass-spring-damper system subjected to a harmonic excitation.
2. **Vibration Measurement Lab: Basics of Measurements and Signal Analysis.** Measurement & identification of simple mechanical systems.
3. **Acoustic Measurement Lab: Measurement of the sound power of a vacuum cleaner.**

Evaluation

Criterion	Final Exam	Mid-term Exam	Quizzes, sheets, and lab reports	Attendance	Total
Points	70	10	15	5	100

Required Reading

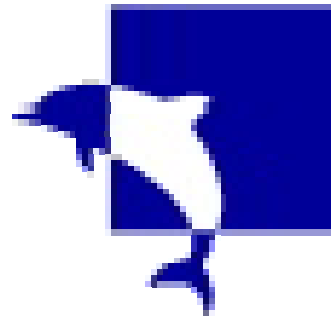
Lecture Notes, PowerPoint handouts of the slides used during lectures. Available on the course website and www.mechsite.com

Course Book: Sound and Vibration. H. Bodén et al., the Royal Institute of Technology (KTH), Sweden. The book will be available at the ASU Sound and Vibration Lab. in week 2 (17th of February). Booking is required.

Acknowledgment



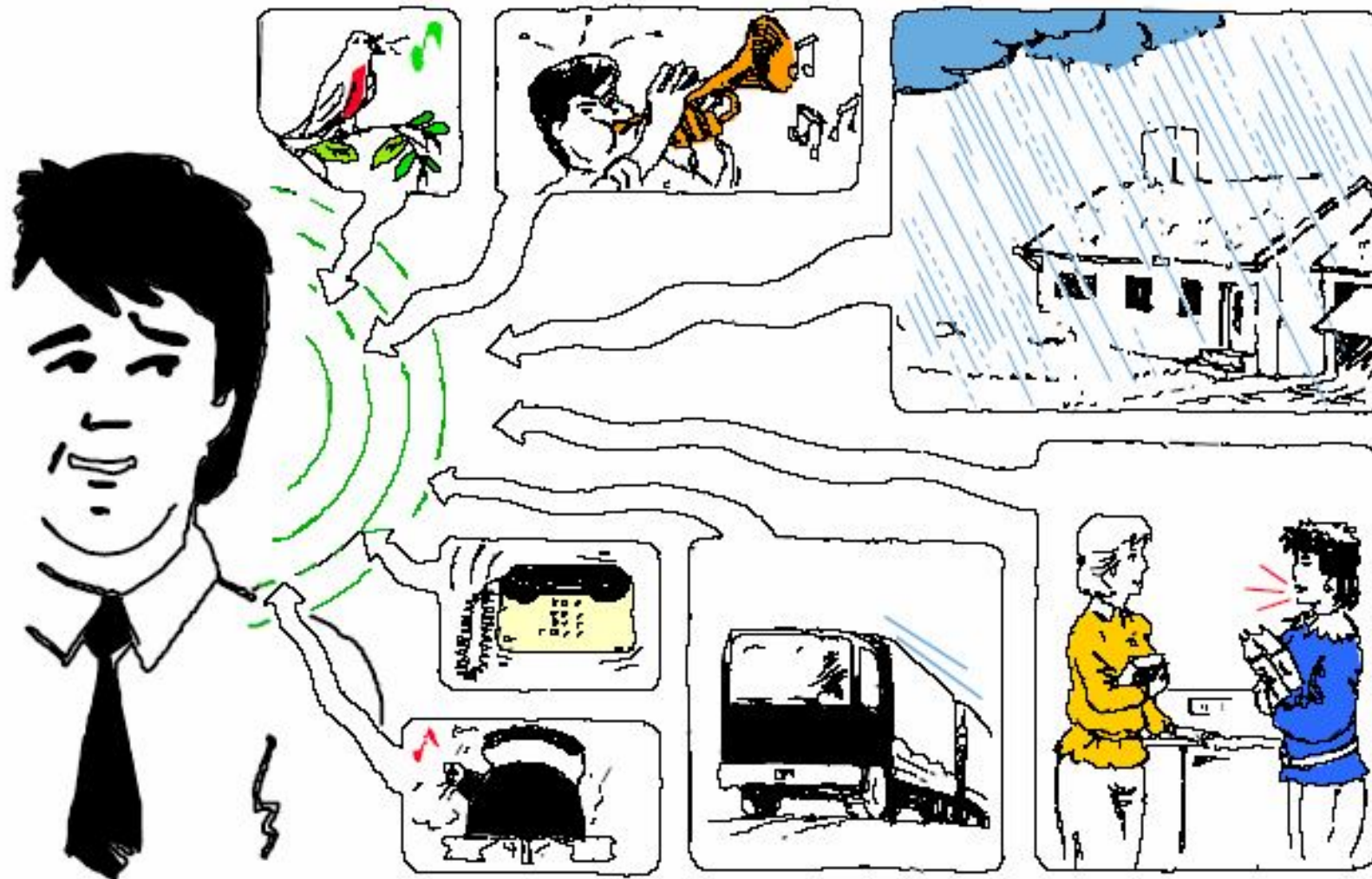
**ROYAL INSTITUTE
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**University
of Southampton**

Brüel & Kjær 

What is Acoustics?



Acoustics

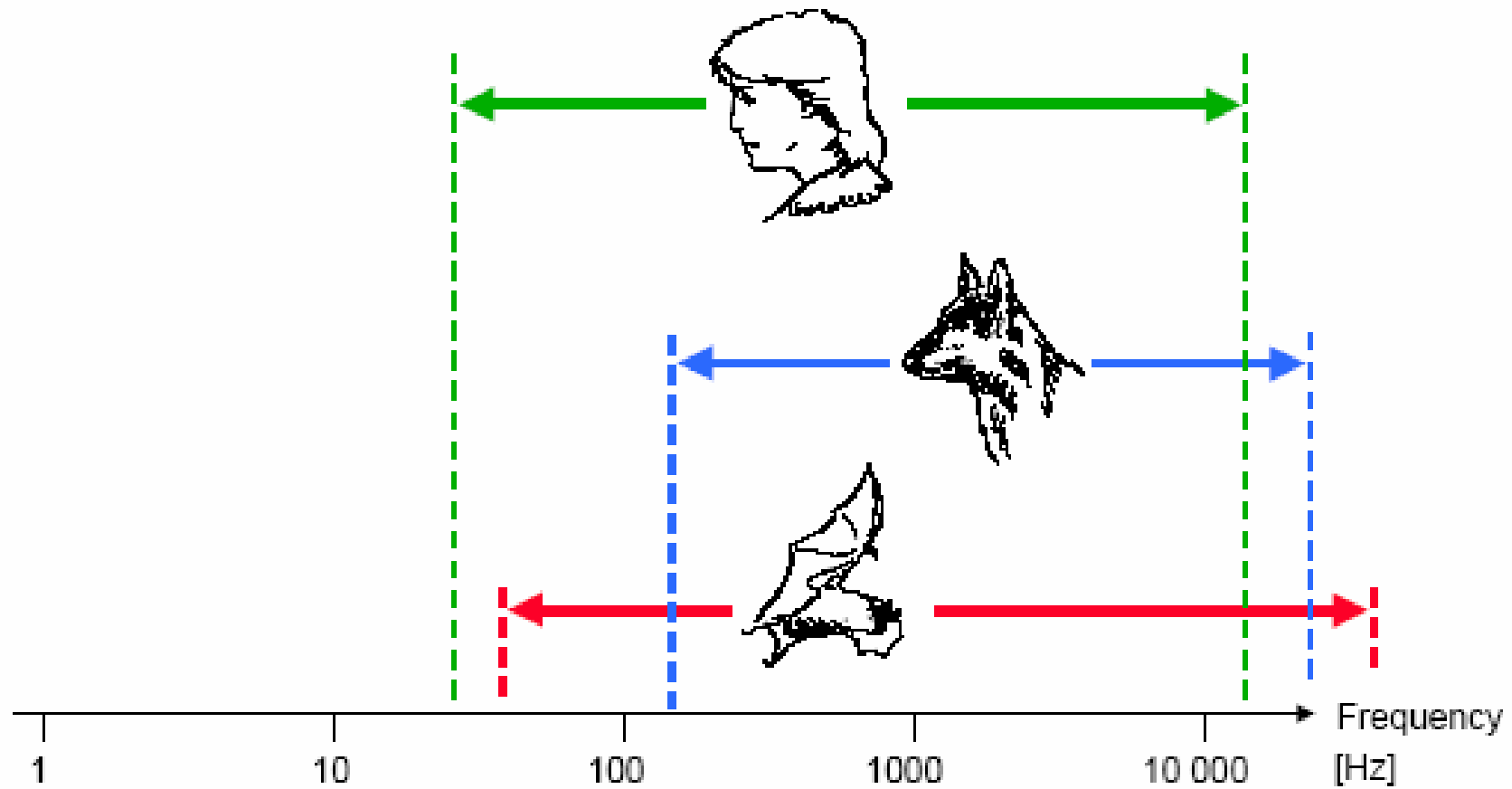
- **acoustics is simply the study of sound**

Sound - is what we hear: "audible air vibrations".

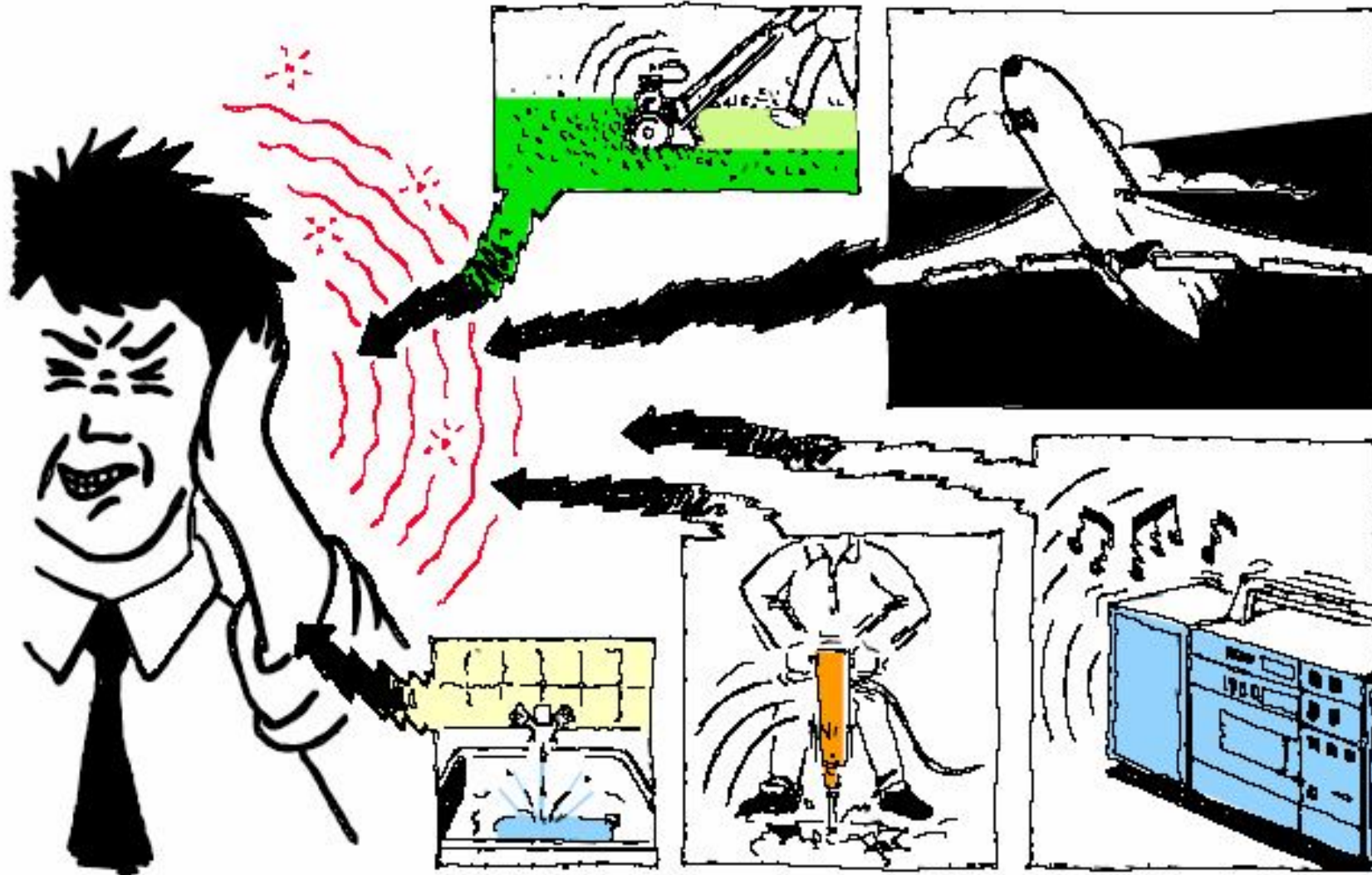
human ear responds to sound in the range 20 Hz to 20000 Hz (= cycles/s)

lower frequencies: 'infra-sound'

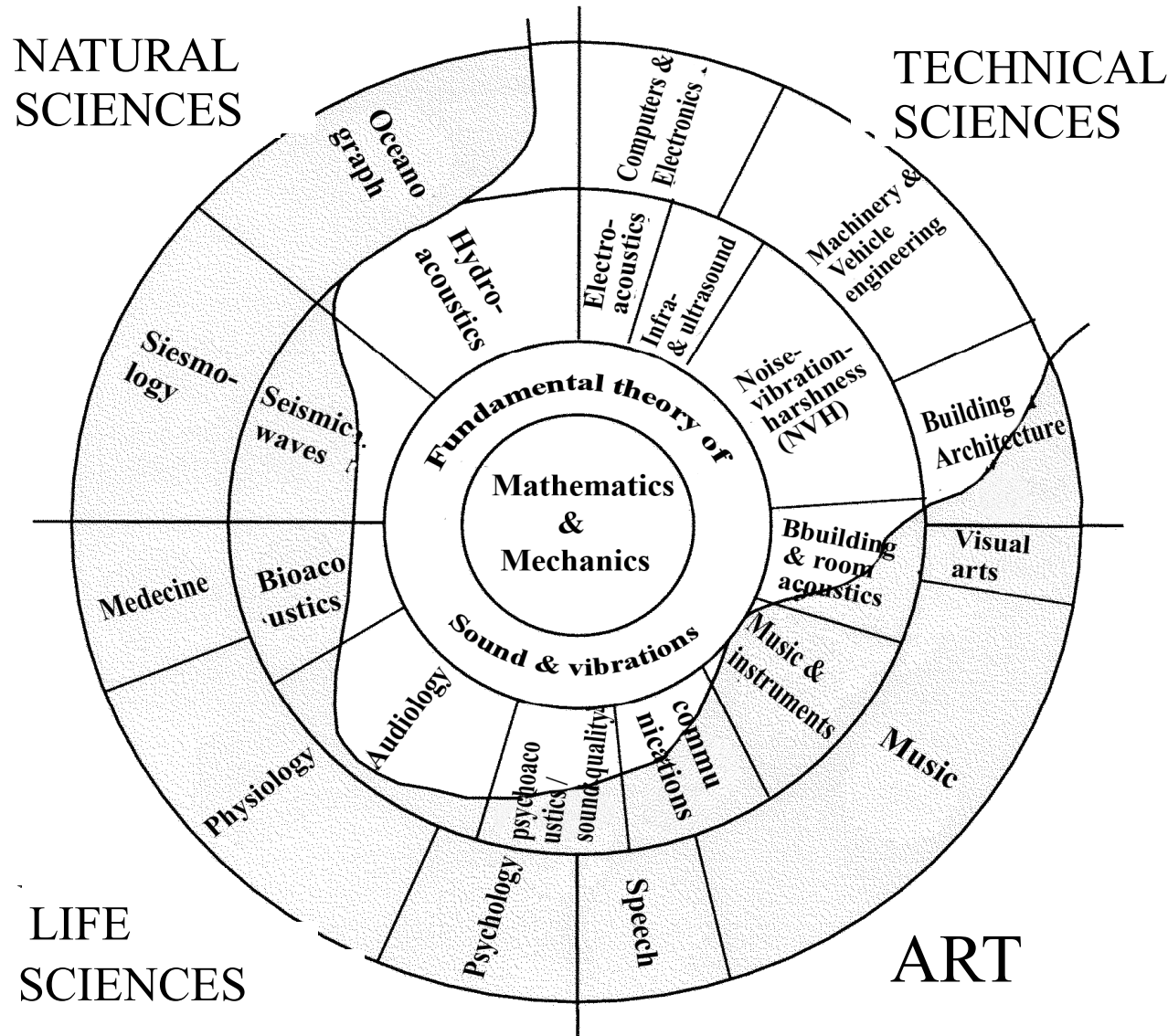
higher frequencies: 'ultra-sound'



Human Hearing: 20 to 20000 Hz

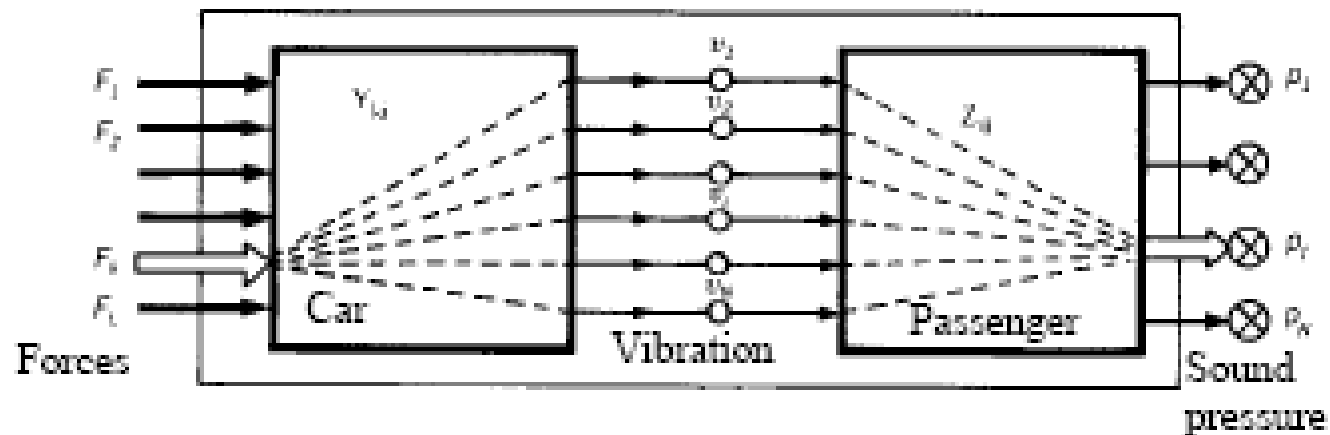
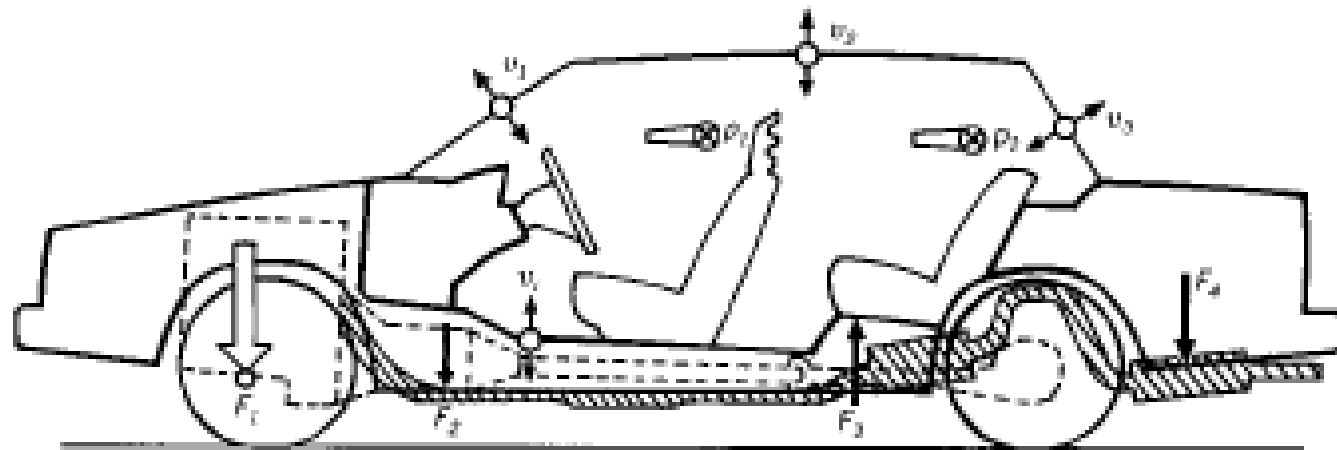


- Noise** - is unwanted sound, disturbing, annoying.
- involves a subjective assessment of the sound.
 - everyone responds differently to sounds.
 - want measures of sound that reflect its acceptability to an 'average' person



The Field of Sound and Vibration

Machinery and Vehicle Acoustics



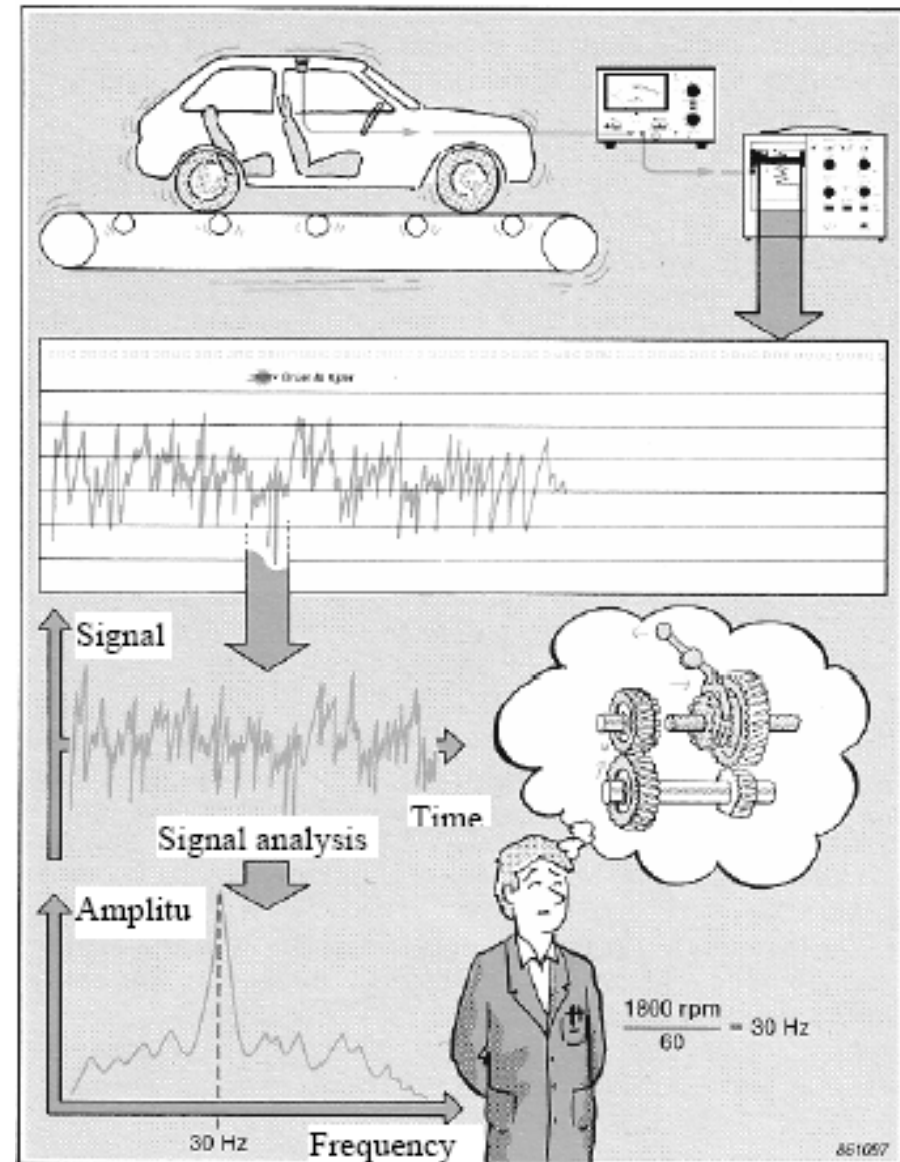
Flow Acoustics



Room Acoustics and Building Acoustics



Signal Analysis



Other Fields

Electro-Acoustics

Musical Acoustics